

1 WHAT IS CLAIMED IS:

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- 3 1. An optical switch array assembly comprising:
- 4 a silicon substrate,
- 5 an optical switch array disposed in the silicon substrate,
- 6 a driving circuit integrated in the silicon substrate with the optical
- 7 switch array and forcing the optical switches on and off, and
- 8 a plurality of holes on the backside of the silicon substrate each
- 9 aligned with an optical switch and guiding an optical beam to the optical switch.
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- 11 2. An optical switch array assembly of claim 1 further comprising an
- 12 addressing circuit integrated in the silicon substrate with the optical switch array
- 13 and locating each optical switch.
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- 15 3. An optical switch array assembly of claim 1 further comprising a glass
- 16 plate mounted on the top of the silicon substrate.
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- 18 4. An optical switch array assembly of claim 1 further comprising a plurality
- 19 of DNA probes disposed on the surface of the glass plate.
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- 21 5. An optical switch array assembly of claim 1 further comprising a plurality
- 22 of hybridized DNA probes disposed on the surface of the glass plate.
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- 1 6. An optical switch array assembly according to claim 1, where said
2 optical switches are Fabry-Perot cavity based optical switches.
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- 4 7. An optical switch array assembly according to claim 4, where
5 said DNA probes are light-synthesized DNA probes.
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- 7 8. An optical switches array assembly according to claim 1, where
8 said optical switches can be switched on and off for releasing and blocking
9 said optical beams.
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- 11 9. An optical switch array assembly according to claim 4, where
12 said light beams are directed to sites where said DNA probes are light-
13 synthesized.
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- 15 10. An optical switch array assembly according to claim 5, where
16 said light beams are directed to sites where said hybridized DNA probes
17 are light-detected.
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- 19 11. A method of making an optical switch array assembly comprising
20 the steps:
21 preparing a silicon substrate with a driving circuit and an
22 addressing circuit fabricated based on a standard MOSFET process,
23 depositing an anti-reflective layer on the surface of the silicon
24 substrate,

1 depositing a first mirror layer on the surface of the anti-reflective
2 layer,
3 depositing a sacrificial layer on the surface of the first mirror layer,
4 depositing a second mirror layer on the sacrificial layer,
5 forming a plurality of refilled trenches to define a plane
6 configuration for a Fabry-Perot cavity,
7 performing metallization to form electrical interconnections and
8 spacers,
9 performing deep etching to create holes on the backside of the
10 substrate, and
11 mounting a glass plate on the top of the substrate.

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13 12. A method of making an optical switch array assembly according to
14 claim 11, further comprising a step for synthesizing a DNA probe array on
15 said glass plate by light illumination.
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17 13. A method of making an optical switch array assembly, according to
18 claim 11 where said anti-reflective layer is a silicon dioxide layer.
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20 14. A method of making an optical switch array assembly, according to
21 claim 11 where said first mirror layer is an amorphous silicon carbide
22 layer.
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1 15. A method of making an optical switch array assembly, according to
2 claim 11 where said first mirror layer is a silicon nitride layer.

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4 16. A method of making an optical switch array assembly, according to
5 claim 11 where said sacrificial layer is a silicon dioxide layer.

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7 17. A method of making an optical switch array assembly, according to
8 claim 11 where said sacrificial layer is an aluminum layer.

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10 18. A method of making an optical switch array assembly, according to
11 claim 11 where said second mirror is an amorphous silicon carbide layer.

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13 19. A method of making an optical switch array assembly, according to
14 claim 11 where said second mirror layer is a silicon nitride layer.

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16 20. A method of making an optical switch array assembly, according to
17 claim 11 where said refilled trenches are filled with silicon dioxide.

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19 21. A method of making an optical switch array assembly, according to
20 claim 11 where said refilled trenches are filled with an amorphous silicon-
21 silicon dioxide-amorphous silicon sandwiched plug.

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1 22. A method of making an optical switch array assembly, according to
2 claim 11 where said refilled trenches are filled with an amorphous silicon-silicon
3 dioxide-amorphous silicon sandwiched plug.
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